# TRIODE-HEPTODE

Triode-heptode. Heptode section intended for use as mixer R.F.- or I.F. amplifier. Triode section intended for use as oscillator in A.M./F.M. receivers.

| QUICK REFERENCE DATA | | | |
|---|---|---|---|
| Triode section | | | |
| Anode current | $I_a$ | 13.5 | mA |
| Transconductance | S | 3.7 | mA/V |
| Amplification factor | $\mu$ | 22 | - |
| Heptode section | | | |
| Anode current | $I_a$ | 9.8 | mA |
| Transconductance | S | 4.3 | mA/V |
| Amplification factor | $\mu_{g_2g_1}$ | 25 | - |

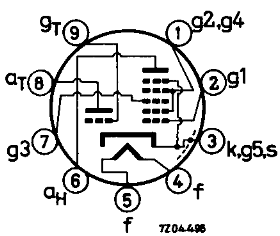
**HEATING:** Indirect by A.C. or D.C.; series supply

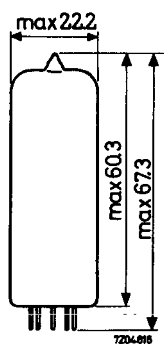
| | | | |
|---|---|---|---|
| Heater current | $I_f$ | 100 | mA |
| Heater voltage | $V_f$ | 19 | V |

**DIMENSIONS AND CONNECTIONS**

Dimensions in mm

Base: Noval



## CAPACITANCES

Triode section

| | | |
|---|---|---|
| Grid to all except anode | $C_{g(a)}$ | 2.6 pF |
| Anode to all except grid | $C_{a(g)}$ | 2.1 pF |
| Anode to grid | $C_{ag}$ | 1.0 pF |
| Grid to heater | $C_{gf}$ | max. 0.02 pF |

Heptode section

| | | |
|---|---|---|
| Grid No.1 to all except anode | $C_{g_1(a)}$ | 4.8 pF |
| Anode to all except grid No.1 | $C_{a(g_1)}$ | 7.9 pF |
| Anode to grid No.1 | $C_{ag_1}$ | max.0.006 pF |
| Grid No.1 to heater | $C_{g_1f}$ | max. 0.17 pF |
| Grid No.3 to all | $C_{g_3}$ | 6 pF |
| Grid No.1 to grid No.3 | $C_{g_1g_3}$ | max. 0.3 pF |
| Grid No.3 to heater | $C_{g_3f}$ | max. 0.06 pF |

Between heptode and triode sections

| | | |
|---|---|---|
| Anode heptode to anode triode | $C_{a_Ha_T}$ | 0.20 pF |
| Anode heptode to grid triode | $C_{a_Hg_T}$ | max. 0.09 pF |
| Grid No.1 heptode to anode triode | $C_{g_1Ha_T}$ | max. 0.06 pF |
| Grid No.1 heptode to grid triode | $C_{g_1Hg_T}$ | max. 0.17 pF |
| Grid No.1 heptode to grid triode + grid No.3 | $C_{g_1H/g_Tg_3}$ | max. 0.45 pF |
| Anode heptode to grid triode + grid No.3 | $C_{a_H/g_Tg_3}$ | max. 0.35 pF |

## TYPICAL CHARACTERISTICS

Triode section

| | | | |
|---|---|---|---|
| Anode voltage | $V_a$ | 100 | V |
| Grid voltage | $V_g$ | 0 | V |
| Anode current | $I_a$ | 13.5 | mA |
| Transconductance | S | 3.7 | mA/V |
| Amplification factor | $\mu$ | 22 | - |

Heptode section

| | | | |
|---|---|---|---|
| Anode voltage | $V_a$ | 160 | V |
| Grid No.3 voltage | $V_{g_3}$ | 0 | V |
| Grids No.2 and 4 voltage | $V_{g_{2+4}}$ | 90 | V |
| Grid No.1 current | $I_{g_1}$ | 0.5 | $\mu$A |
| Grid No.1 voltage | $V_{g_1}$ | -0.5 | V |
| Anode current | $I_a$ | 9.8 | mA |
| Grids No.2 and 4 current | $I_{g_{2+4}}$ | 6.1 | mA |
| Transconductance | S | 4.3 | mA/V |
| Amplification factor | $\mu_{g_2g_1}$ | 25 | - |

## OPERATING CHARACTERISTICS

Heptode section as mixer

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Supply voltage | $V_b$ | 100 | | 170 | | 200 | | V |
| Anode resistor | $R_a$ | 0 | | 0 | | 0 | | Ω |
| Grids No.2 and 4 resistor | $R_{g_{2+4}}$ | 10 | | 10 | | 10 | | kΩ |
| Grid triode + grid No.3 resistor | $R_{g_T+g_3}$ | 47 | | 47 | | 47 | | kΩ |
| Grid triode + grid No.3 current | $I_{g_T+g_3}$ | 115 | | 200 | | 230 | | μA |
| Grid No.1 current | $I_{g_1}$ | 0.5 | - | 0.5 | - | 0.5 | - | μA [1] |
| Grid No.1 voltage | $V_{g_1}$ | -0.5 | -12 | -0.5 | -19 | -0.5 | -22 | V |
| Anode voltage | $V_a$ | 100 | - | 170 | - | 200 | - | V |
| Grids No.2 and 4 voltage | $V_{g_{2+4}}$ | 56 | - | 88 | - | 100 | - | V |
| Anode current | $I_a$ | 2.0 | - | 3.3 | - | 4.1 | - | mA |
| Grids No.2 and 4 current | $I_{g_{2+4}}$ | 4.4 | - | 8.2 | - | 10 | - | mA |
| Conversion conductance | $S_c$ | 850 | 8.5 | 1100 | 11 | 1200 | 12 | μA/V |
| Internal resistance | $R_i$ | 0.75 | min.3 | 0.8 | min.3 | 0.85 | min.3 | MΩ |
| Equivalent noise resistance | $R_{eq}$ | 33 | - | 30 | - | 32 | - | kΩ |

[1] Grid current bias obtained with $R_{g_1}$ = 1 MΩ and with zero volts a.g.c. voltage; resulting grid No.1 voltage: -0.5 V.

## OPERATING CHARACTERISTICS (continued)

Heptode section as R.F. or I.F. amplifier

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Supply voltage | $V_b$ | 100 | | 170 | | 200 | | V |
| Anode resistor | $R_a$ | 0 | | 0 | | 3.9 | | kΩ |
| Grids No.2 and 4 resistor | $R_{g_{2+4}}$ | 18 | | 18 | | 18 | | kΩ |
| Grid No.3 voltage | $V_{g_3}$ | 0 | | 0 | | 0 | | V |
| Grid No.1 current | $I_{g_1}$ | 0.5 | - | 0.5 | - | 0.5 | - | μA [1] |
| Grid No.1 voltage | $V_{g_1}$ | -0.5 | -15.7 | -0.5 | -26 | -0.5 | -30 | V |
| Anode voltage | $V_a$ | 100 | - | 170 | - | 162 | - | V |
| Grids No.2 and 4 voltage | $V_{g_{2+4}}$ | 52 | - | 80 | - | 90 | - | V |
| Anode current | $I_a$ | 4.1 | - | 8.0 | - | 9.8 | - | mA |
| Grids No.2 and 4 current | $I_{g_{2+4}}$ | 2.7 | - | 5.0 | - | 6.1 | - | mA |
| Transconductance | S | 2900 | 29 | 3900 | 39 | 4300 | 43 | μA/V |
| Internal resistance | $R_i$ | 0.45 | min.10 | 0.4 | min.10 | 0.35 | min.10 | MΩ |
| Amplification factor | $\mu_{g_2 g_1}$ | 24 | - | 25 | - | 25 | - | - |
| Equivalent noise resistance | $R_{eq}$ | 4.0 | - | 4.0 | - | 4.3 | - | kΩ |

Triode section as oscillator

| | | | | | |
|---|---|---|---|---|---|
| Supply voltage | $V_b$ | 100 | 170 | 200 | V |
| Anode resistor | $R_a$ | 15 | 15 | 15 | kΩ |
| Grid triode + grid No.3 resistor | $R_{g_T+g_3}$ | 47 | 47 | 47 | kΩ |
| Grid triode + grid No.3 current | $I_{g_T+g_3}$ | 115 | 200 | 230 | μA |
| Anode current | $I_a$ | 2.5 | 4.5 | 5.4 | mA |
| Effective transconductance | $S_{eff}$ | 0.58 | 0.65 | 0.65 | mA/V |

[1]) Grid current bias obtained vith $R_{g_1}$ = 1 MΩ and with zero volts a.g.c. voltage; resulting grid No.1 vol age: -0.5 V.

**LIMITING VALUES** (Design centre rating system)

Heptode section

| | | | |
|---|---|---|---|
| Anode voltage | $V_{a_o}$ | max. 550 | V |
| | $V_a$ | max. 250 | V |
| Anode dissipation | $W_a$ | max. 1.8 | W |
| Grids No.2 and 4 voltage | $V_{g_{2+4_o}}$ | max. 550 | V |
| | $V_{g_{2+4}}$ | max. 125 | V |
| Grids No.2 and 4 voltage ($I_a$ max. 1 mA) | $V_{g_{2+4}}$ | max. 250 | V |
| Grids No.2 and 4 dissipation | $W_{g_{2+4}}$ | max. 1 | W |
| Cathode current | $I_k$ | max. 18 | mA |
| Grid No.1 resistor | $R_{g_1}$ | max. 3 | MΩ |
| Grid No.3 resistor | $R_{g_3}$ | max. 20 | kΩ |
| Grid No.3 resistor grid No.3 directly connected to grid triode | $R_{g_3}$ | max. 3 | MΩ |
| Cathode to heater voltage | $V_{kf}$ | max. 100 | V |

Triode section

| | | | |
|---|---|---|---|
| Anode voltage | $V_{a_o}$ | max. 550 | V |
| | $V_a$ | max. 250 | V |
| Anode dissipation | $W_a$ | max. 0.8 | W |
| Cathode current | $I_k$ | max. 6.5 | mA |
| Grid resistor | $R_g$ | max. 3 | MΩ |
| Cathode to heater voltage | $V_{kf}$ | max. 100 | V |

PHILIPS

Data handbook

Electronic components and materials

**UCH81**

| **page** | **sheet** | **date** |
|---|---|---|
| 1 | 1 | 1969.01 |
| 2 | 2 | 1969.01 |
| 3 | 3 | 1969.01 |
| 4 | 4 | 1969.01 |
| 5 | 5 | 1969.01 |
| 6 | 6 | 1969.01 |
| 7 | FP | 1999.07.29 |